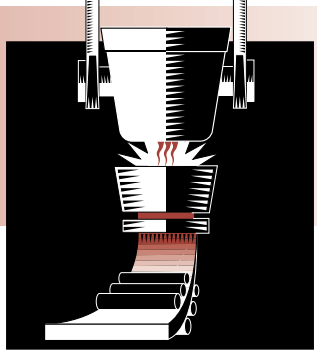
STEEL

Project Fact Sheet



Evaluation of Sustainable Steelmaking Using Biomass and Waste Oxides

Reduction of iron ore using wood charcoal in steelmaking may reduce net greenhouse gases by 90 percent

Benefits

- Reduced greenhouse gas emission by over 90 percent
- Significantly decreased capital and operating costs
- Increased productivity of the rotary hearth furnace
- Increased recycling of waste oxides in steelmaking

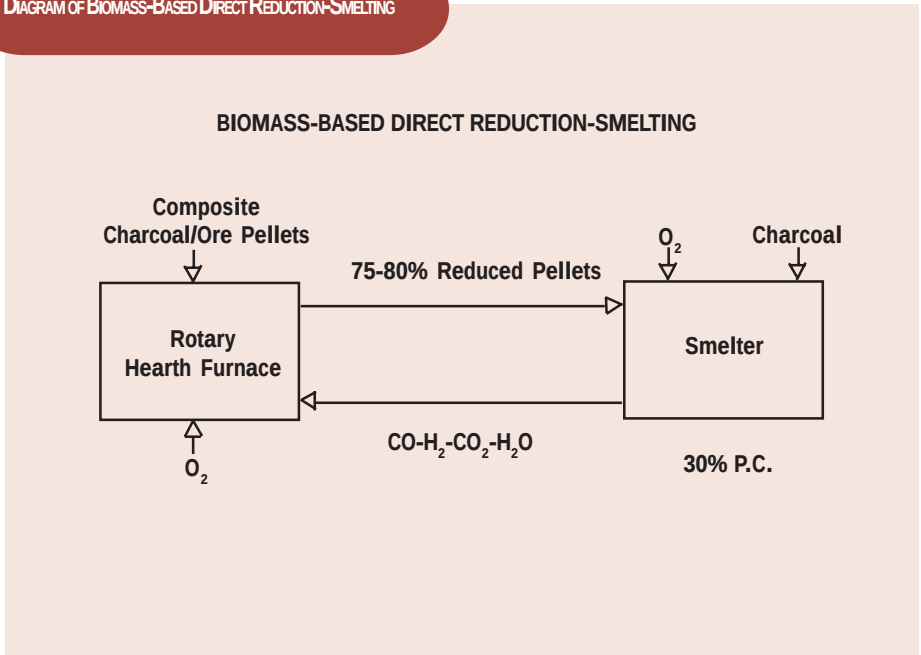
Applications

A process using wood charcoal in the pellets by feeding it into a smelting furnace, may complete the reduction and separate the gangue by melting. The metal will be low in sulfur, if biomass is used, and be an excellent feed to an electric arc furnace or basic oxygen furnace.

The American Iron and Steel Institute's (AISI) Technology Roadmap Program (TRP) is conducting this one-year project at the Carnegie Mellon University in Pittsburgh, Pennsylvania. The project goal is to use wood charcoal, a renewable energy source, to reduce iron ore and waste oxides. Wood charcoal contains very low levels of gangue, sulfur, and volatile matter, therefore, provides a very desirable reductant to perform the reduction of iron ore. The reduced iron ore can be a feed to a variety of melting furnaces. Unfortunatley, wood charcoal does not have the structural properties that are required by modern U.S. blast furnaces.

There are a number of processess being developed that use composite pellets of ore or waste oxides and a carbonaceous material, such as coal char or coke, which are reduced in the solid state using a rotary hearth or similar type furnace. These processes produce a product which is too high in gangue and sulfur to be used effectively in the electric arc furnace. This project proposes to use wood charcoal in the pellets to overcome the gangue and sulfur problem. Reduced iron ore containing low contents of gangue and sulfur can be a direct feed to a variety of melting furnaces. The metal will be low in sulfur, if biomass is used, and will be an excellent feed to an electric arc furnace or basic oxygen furnace.

Diagram of Biomass-Based Direct Reduction-Smelting



Evaluation of Sustainable Steelmaking Using Biomass and Waste Oxides (Continued)

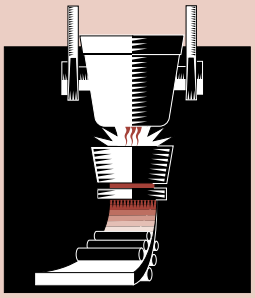
If wood charcoal is used as the energy source and reductant along with the growing of wood, the net greenhouse gas emissions can be reduced by 90 percent or more. It has been estimated that a forest 35 kilometers by 35 kilometers with one seventh being harvested yearly is required for one million tons of iron production. Additionally, by-products from forestry and paper production could possibly be used. The growing of the trees converts the carbon dioxide back to carbon and oxygen. Since wood charcoal contains little or no sulfur and low ash, sulfur dioxide (SO_2) emissions are reduced, less slag is produced, and the metal is low in sulfur.

Project Description

Goal: To conduct preliminary research for a process using wood charcoal and ore or waste oxide pellets in a rotary hearth and smelting furnaces. The kinetics of reduction of ore or waste oxide-charcoal pellets will be determined. The possibility of producing charcoal in the U.S. from trees of forestry waste products will be examined.

Progress and Milestones

- Project Start Date, April 2000.
- Experimentally determine the rates of reduction of North American ores and waste oxides using wood charcoal available to U.S. steelmakers.
- Compare these reduction rates to conventional reductants, such as coal, coke, and coal char.
- Conduct preliminary scoping study to assess the possibility and economics charcoal production.
- Project Completion Date, April 2001.



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